MINOR STUDIES FROM THE PSYCHOLOGICAL LABORATORY OF CORNELL UNIVERSITY

Communicated by E. B. TITCHENER, H. P. WELD and K. M. DALLENBACH

XLVII. SIZE *vs.* INTENSITY AS A DETERMINANT OF ATTENTION

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This paper is related to two of the experimental studies on the determination of attention which have been published from the Cornell Laboratory. Meads, working with form *vs.* intensity, obtained from five observers the positive result "that a light-form of relatively low intensity may have as great a power to attract attention as a formless light of relatively high intensity."[1] Curtis and Foster, working with size *vs.* intensity, were unable to reach any positive conclusion. Their three observers gave widely differing results: one showed a positive and one a slightly negative effect of size, while to the third size was apparently indifferent; and in the case in which the effect of size was negative, spatial position proved to be more important than a four-fold increase in area.[2]

It may very well be the case that form is, and size is not, a powerful determinant of attention. If this conclusion is sound, then the diversity of result obtained by Curtis and Foster means simply that in their experiment the effect of size was cut across by other influences which the plan of the experiment did not permit them to bring under control. There is, however, between the two studies a difference in method. Meads employed the method of limits; Curtis and Foster, taking their cue from the report of one of Meads' observers (Professor Weld) that expectation might be a disturbing influence, changed over to the method of constant stimulus-differences.[3] Since now the method of limits has given positive results, and the method of constant stimulus-differences has given results that are positive, negative and indifferent, it seems plainly necessary to attack the problem of size by the method of limits. This is what we have done in the present paper.

Apparatus.

The apparatus was set up, as usual, in a dark room. The observer, screened by heavy black curtains, sat comfortably at a table, his head held firmly in position by an adjustable biting board. Facing him at the distance of approximately 50 cm. was the ground glass plate upon which the two areas and the fixation-point appeared. The stimuli were as before: a standard Greek cross of 56 sq. cm. was compared with similar crosses of half and twice its area. The fixation-point lay between the crosses, at a distance of 10 cm. from each; it was illuminated throughout the experiment, though it was not visible during the exposure of the crosses.

[1] L. G. Meads, "Form *vs.* Intensity as a Determinant of Attention," this JOURNAL, xxvi., 1915, 151.

[2] J. N. Curtis and W. S. Foster, "Size *vs.* Intensity as a Determinant of Attention," this JOURNAL, xxviii., 1917, 294f.

[3] Meads, 151; Curtis and Foster, 293.

Exposure was made by a Wundt gravity tachistoscope set for one-tenth of a second; the actual time, as measured by the Hipp chronoscope, was 100.3 ± 0.7 sigma. Heavy felt pads, laid at the base of the instrument to catch the shutter, made the exposure almost noiseless.[4]

The light was obtained from a 40 watt Mazda Daylight lamp placed in a projection lantern behind the tachistoscope. The rays passed into a diffusion box which was white inside, and whose far end contained two circular ground glass windows, 18 cm. apart and 8 cm. in diameter. The amount of light issuing from these windows was controlled by cardboard shutters, which by a graded series of circular openings carried the illumination by steps of 4% down to 12%, by steps of 2% down to 4%, and by steps of 0.5% down to 0.5%. The illumination of the comparison crosses might be varied within these limits; that of the standard cross remained constant at 20%.[5]

Experiment.

The following instructions, identical with those of the previous work, were read to the observers at the beginning of every experimental hour. "At the signal 'Now' put your attention definitely on the fixation-point. Two crosses of unequal size will be exposed. Judge which of them, if either, is the more clear; that is, which of them catches your attention the more." The method employed, for the reasons given above, was the method of limits. The observers judged 'Right,' 'Left,' or 'Equal.' 'Doubtful' judgments, in accordance with present practice, were thrown out, and the observations were repeated.[6]

The observers were F. L. Dimmick (*D*) and L. B. Hoisington (*H*), assistants in psychology; Myrl Cowdrick (*C*), graduate student in the department; and K. M. Dallenbach (*Da*). *D, H.* and *Da* were highly practised in the observation of clearness.[7]

Before the experiment began, a preliminary series was given to every observer in order to determine the critical range. Short warming-up series were also given at the beginning of every experimental hour. The experimental series were arranged for measurement of the space error and for compensation of the irregular influences of practice and fatigue.

Every observer made four series: two with the large cross, standard right and left; and two with the small cross under similar conditions. The series was composed of ten ascending and ten descending observations. The order in which the four series were presented to the observers was as follows:

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[4] Meads (150) used a spring tachistoscope with a time of 110 ± 8 sigma; Curtis and Foster (293) used a pendulum tachistoscope with a time of 110 ± 3 sigma.

[5] Meads and Curtis and Foster used an episcotister; but Curtis and Foster found the range of experimental variation insufficient (294). Our arrangement overcomes this difficulty.

[6] S. S. George, "Attitude in Relation to the Psychophysical Judgment," this JOURNAL, xxviii., 1917, 33ff.

[7] *D* is the observer who showed the positive effect of size in the work of Curtis and Foster (293, 295); *H* had observed in a study of the measurement of attention (this JOURNAL, xxvii., 1916, 459); and *Da* had observed in several such studies (this JOURNAL, xxiv., 1913, 465ff.; xxvii., 1916, 443ff.; xxix., 1918, 204ff.).

SERIES	OBSERVERS			
	D	*H*	*Da*	*C*
Large cross, standard right	1	2	3	4
Large cross, standard left	2	3	4	1
Small cross, standard right	3	4	1	2
Small cross, standard left	4	1	2	3

A series was completed within a single experimental hour.

Results.—The results are given in the table below:

O	Position	Small Cross				Large Cross			
		Av.	M. V.	Gen'l Av.	Deviation from stan'd	Av	M. V.	Gen'l Av.	Devia'n from Stand'd
D	right	53.0	13.8	43.2	+23.2	10.9	4.7	10.5	—9.5
	left	33.4	8.3			10.1	4.7		
H	right	79.2	4.8	59.1	+39.1	27.6	5.8	15.2	—4.1
	left	39.0	10.6			2.9	1.5		
Da	right	40.2	6.6	38.9	+18.9	18.0	2.5	14.0	—6.0
	left	37.6	5.2			10.1	4.3		
C	right	30.6	5.2	24.2	+4.2	23.0	5.6	19.0	—1.0
	left	17.7	3.1			15.1	3.7		

This table shows the average per cent. of illumination necessary for the comparison crosses if they are to be equal in clearness to the standard cross. The data of the 5th and 6th, 9th and 10th columns indicate that the small cross, to be as clear as the standard, must be more intense; and that the large cross, to be as clear as the standard, must be less intense. The *direction* of our results is thus constant for all four observers. There is, however, a marked difference between *C* and the other observers: her *plus* and *minus* deviations from the standard are very small. *C,* it may be noted, was a comparatively untrained observer. If we consider only the results of the three observers who were highly trained in the observation of clearness, we find uniformity of tendency, well-marked in all cases, though showing individual variation of the order 2 to 1. For *C,* the *m. v.* is also larger with both crosses than the difference between the standard and comparison stimuli. Even for the trained observers, the *m. v.* with the large cross is not always satisfactory.

But although the direction of the results is constant, the *magnitude of the space error* proves that the effect of size was cut across and obscured by another influence. The data which indicate the effect of position are given in the 3d and 7th columns of the table. For both of the comparison areas and for all observers the left-hand position is the more favored. The position-ratio is 2 to 1 for *H* and *C* with the small cross, and rises as high as 9 to 1 for *H* with the large cross. The left-hand position has, however, no advantage in the matter of relative variation.

Conclusions.—We conclude that the difference between the results obtained by Meads for form and by Curtis and Foster for size is a true difference, not attributable to the difference of the methods employed.[8]

If we may judge by the results of our trained observers, size as determinant of attention may bear to intensity a ratio which varies from 3:1 to 4:3. For a less trained observer size was indifferent.

In the two experiments upon size (that of Curtis and Foster and our own) spatial position proved to be a major disturbing influence. It seems that the left-hand position has an attentional advantage. We are now undertaking a further and more systematic study of this subject.

[8] Cf. also H. Woodrow, "Outline as a Condition of Attention," *Journal Exp. Psychology,* i, 1916, 23 ff.